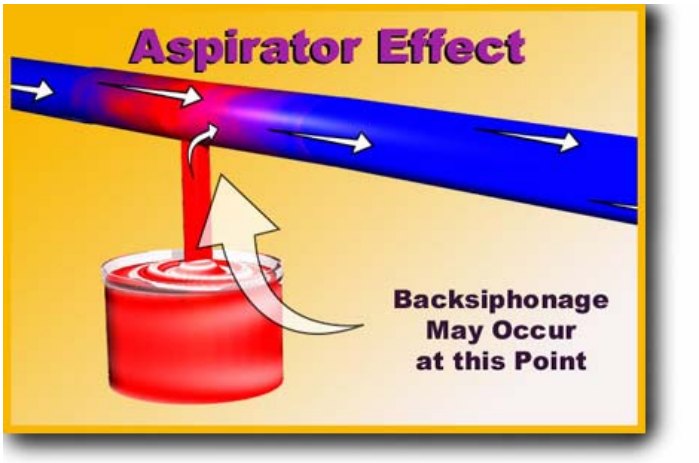
DENVER WATER

# *Denver Water's 2003 Cross Connection Control Summary Report*

## WHAT IS A CROSS-CONNECTION?

Most of us take it for granted that our drinking water is safe, and when it leaves the treatment plant it is. A cross-connection or backflow condition could manifest in a plumbing system or public water supply system, resulting in drinking water becoming contaminated or polluted with bacteria, chemicals or other potentially harmful substances.




Cross connections are the paths by which contaminants or pollutants may enter the public water supply through a physical connection with a non-potable source. Backflow conditions can result from back-siphonage, when the pressure is low in the public water system because of high user demand or the use of fire hydrants. As an example, when a pressurized liquid system, attached to the potable system, overcomes the pressure in the public water system, that liquid could be forced into the drinking water system.

According to the Safe Drinking Water Act of 1986 and the regulations of the Colorado Department of Public Health and Environment, drinking water utilities have the primary responsibility to prevent any substance or water from any unapproved source, from entering the public water supply. Connections to the public potable water supply are only allowed if an approved backflow prevention assembly is installed at the water service connection.

Denver Water's responsibility, as a drinking water utility, begins at the source, and includes all of the public water distribution system, and the service connections, and ends at the point of delivery to the consumer's water system. In addition, Denver Water must exercise reasonable vigilance to insure that the consumer has taken proper steps to protect the public potable water system. To insure that the proper precautions are taken, Denver Water will determine the degree of hazard to the public potable water system. Denver Water will then notify targeted businesses that they are required to install an approved backflow prevention assembly on the entrance to their water service.

The consumer has the responsibility of preventing pollutants and contaminants from entering the public potable water system from their end. The consumer's responsibility starts at the point of delivery from the public water system. The consumer, at their expense, is responsible for installing, operating, testing, and maintaining approved backflow prevention assemblies as required by Denver Water. The consumer must maintain accurate records of tests and repairs made to backflow prevention assemblies and provide Denver Water with copies of these records. Denver Water will notify consumers, annually, of the need to have their backflow prevention devices re-tested, and to send a copy of these tests to the Denver Water Backflow Prevention Office.

## Where are Cross Connections Found?

Cross connections can be found anywhere the public supply connects with residential or commercial plumbing systems. A few examples follow:

- Toilet tanks without anti-siphon devices on the flush valve
- Swimming pools/hot tubs/vats filled with submerged hoses
- Insecticides and herbicides sprayed with hoses connected to the water supply
- Sprinkler systems lacking proper backflow devices
- Boilers and water treatment systems, solar heating systems

Businesses and homeowners need to be aware of this potential threat and what steps can be taken to avoid a cross connection or backflow situation.

## Overview of Denver Water's Program

The Denver Water Backflow Prevention Program works in the following manner:

- Customers are reviewed and ranked according to their business's type of cross-connection risk.
- Customers are informed in writing, of the required device for their type of business.
- Correspondence (either through fax, phone or mail) is received indicating that the device has been installed and/or tested.
- Customers are notified annually, that their device(s) needs to be re-tested.
- Records of the testing, from certified backflow prevention inspectors, are entered into the Denver Water Cross Connection Control Database.
- If a business fails to comply after the first notification:
  - Second and third notices are sent.
- If a customer is unable to comply after notification, a temporary extension may be granted.
  - The business will be re-notified at the end of that time.
- If a business continually fails to comply:
  - Their water service can be shut-off, though this is undesirable.
  - The Cross Connection Control group will work with the customer towards compliance.
  - To date, no water services have been shut-off for failure to comply.
- All transaction records are kept for at least three years:
  - To comply with the Colorado Department of Public Health and Environment's annual water system certification inspections.

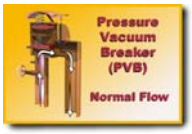
## EXAMPLES OF TARGETED BUSINESSES AND CUSTOMERS

Some of the types of businesses or premises, for which physical separation from Denver's water system by containment is mandatory, are listed here, however, this is not a complete list:

1. Unapproved auxiliary water supplies on premises, including private wells
2. Premises where access is limited or restricted because of security concerns
3. Hospitals, morgues, mortuaries, medical clinics, dental clinics, and autopsy facilities
4. Laboratories
5. Sewage treatment plants or facilities
6. Food and beverage processing plants
7. Chemical plants
8. Metal plating industries
9. Electrical and electronic component manufacturers
10. Radioactive material processing plants
11. Car and truck wash facilities
12. Hydraulic testing facilities
13. Packing houses, rendering plants, tanneries, and stock yard facilities
14. Steam generating facilities
15. Laundries, dry cleaners, Laundromats
16. Photographic film processing facilities
17. Swimming pools and health spas
18. Greenhouses
19. Multi-story buildings in excess of 30 feet above finished grades
20. Fire protection systems
21. Landscape irrigation systems
22. Taxidermy shops
23. Battery shops
24. Kennels, pet shops
25. Solar installations
26. Printing shops, screen printing shops
27. Jewelry manufacturers
28. Radiator shops
29. Water service connections to commercial, industrial and institutional facilities

The selection of the appropriate type of backflow prevention for the above listed businesses and facilities are displayed on the next page in Table 1. This table provides a correlation between cross-connections, degree of hazard, and mandatory backflow prevention measures.

## TABLE 1
## HAZARDOUS PREMISE CONTAINMENT MINIMUM PROTECTION AT THE METER

| TYPE OF HAZARD ON PREMISES |  |  |  |  |
|---|---|---|---|---|
| Sewage Treatment Plants and Lift Stations | X | X | | |
| Domestic Water Booster Pumps | | | X | |
| Reservoirs, Cooling Towers, and Re-circulating Systems | X | X | | |
| Power and Steam Generation Facilities | X | X | | |
| Hydraulic Testing Equipment | X | X | | |
| Laboratory Facilities | X | X | | |
| Landscape Irrigation Systems (includes Green-houses) | X | X | | X |
| Fire Fighting Systems<br>A. Health Hazard<br>B. Non-Health Hazard | X | X | X | |
| Unapproved Auxiliary Supply | X | X | | |
| Restricted Access Facilities | X | X | | |
| Hospitals, Medical/Dental Clinics | X | X | | |
| Mortuaries, Morgues, and Taxidermists | X | X | | |
| All Commercial Buildings | X | X | | |
| Swimming Pools/Health Spas | X | X | | |
| Petroleum Processing Facilities | X | X | | |
| Radioactive Material Processing | X | X | | |
| Car Wash Facilities | X | X | | |
| Food Processing and Beverage Bottling Facili-ties | X | X | | |
| Packing Houses and Rendering Plants, Stock-yards and Tanneries | X | X | | |
| RV Drinking Water Fill Stations | | | | X |
| RV Sanitary Stations | X | | | |
| Concrete Batch Plants, and Sand and Gravel Facilities | X | X | | |

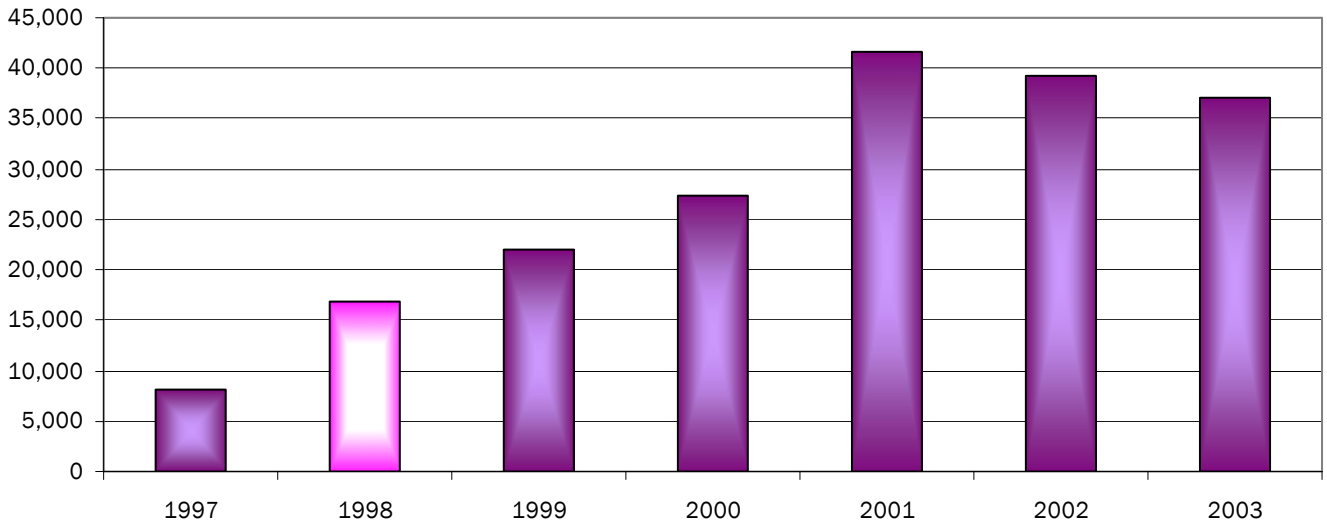
The Transaction report below is a breakdown of the letters that were sent to customers each quarter of 2003 and the total amount of correspondence mailed and received in 2003. The graphs below give a pictorial view of the total correspondence, and the devices installed and tested over the last seven years. The total number of transactions was 37,020 in 2003.

## TRANSACTION REPORT OF ACTIVITIES FOR 2003

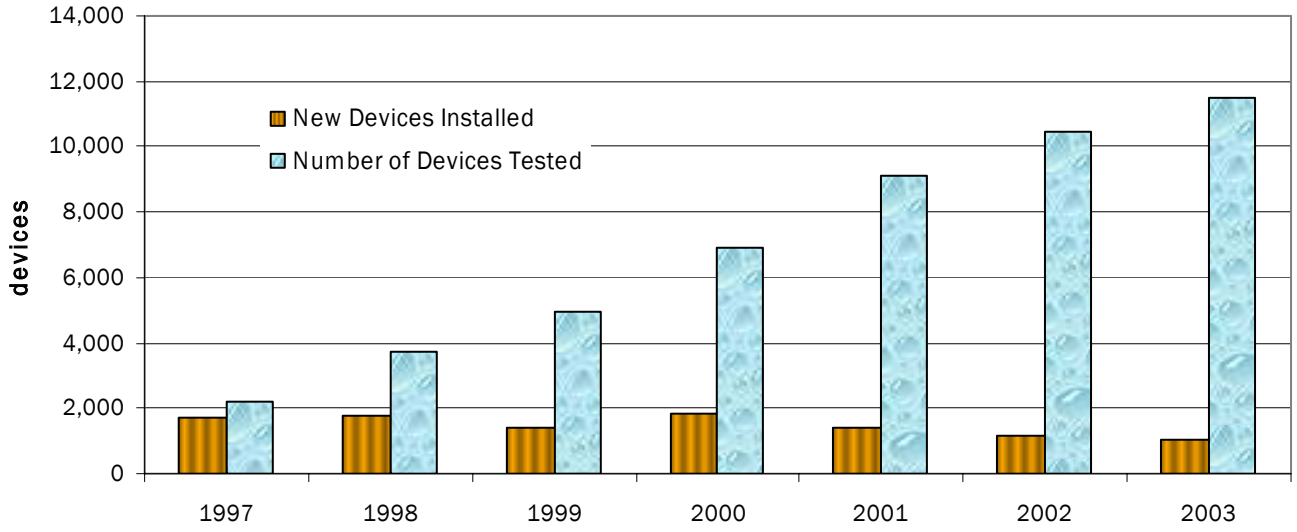
| Transaction Description | Quarter 1 | Quarter 2 | Quarter 3 | Quarter 4 | *Totals* |
|---|---|---|---|---|---|
| Device Required | 1620 | 2065 | 465 | 126 | 4,276 |
| Device Required—2nd Notice | 854 | 898 | | 2 | 1,754 |
| Device Required—3rd Notice | 1011 | 424 | | 2 | 1,437 |
| Test Due | 2523 | 3559 | 706 | 2291 | 9,079 |
| Test Due—2nd Notice | 1685 | 2297 | 410 | 311 | 4,703 |
| Test Due—3rd Notice | 1304 | 1260 | 1217 | 476 | 4,257 |
| Test Result | 2388 | 2799 | 3167 | 3160 | 11,514 |
| **Grand Totals** | ***11,385*** | ***13,302*** | ***5,965*** | ***6,368*** | ***37,020*** |

# Graphs of the Transactions for 2003

## Total Correspondence Mailed




## Cross Connection Control Devices



## IN CONCLUSION

Historically, a significant portion of waterborne disease outbreaks, reported nationally by the CDC (Centers for Disease Control and Prevention), were caused by distribution system deficiencies. Distribution system deficiencies are defined in the CDC's publication Morbidity and Mortality Weekly Report as cross-connections, contamination of water mains during construction or repair, and contamination of a storage facility. Between 1971 and 1994 approximately 53 waterborne disease outbreaks were associated with cross-connections or back-siphonage. During this time period, fifty-six outbreaks were associated with other distribution system deficiencies (Craun, Pers. Comm. 1997b).

There is no centralized repository where cross connection or backflow incidents are reported or recorded. The vast majority of these incidents are probably not reported. Specific backflow incidents are described in detail in the USEPA's (United States Environmental Protection Agency's) Cross-Connection Control Manual (USEPA, 1989a). A system, where a cross-connection exists, is still somewhat protected, if positive water pressure is maintained in the pipes or conduits. Denver Water is fortunate that we have not encountered any major cross-connections causing disease or health effects in our system. Although smaller, isolated incidents have occurred. Continuance of our current program, and subsequent implementations should give us better assurances that outbreaks, such as those reported by the CDC, will not occur in our system.

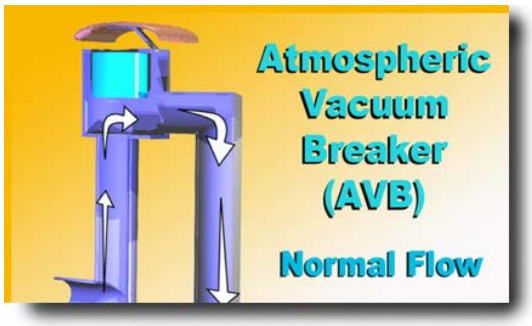
The Cross Connection Control Section has published a brochure entitled, A Water Quality Warning About Cross Connections, aimed at informing the homeowner of potential cross connections in their system. These brochures have been disseminated during public tours, mailed out to customers along with other water quality information, and are available at Denver Water's main office as well as the Water Quality Laboratory.

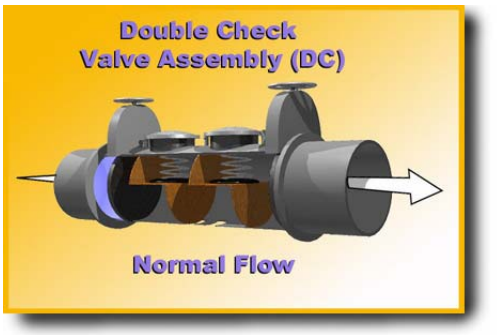
Homeowners have a stake in protecting water quality, though homeowners are not targeted in the current program. Their sprinkler systems and indoor water usage habits have the potential to back siphon into the potable water system. Future implementation plans will evaluate whether or not to include homeowners and multiple dwelling communities.

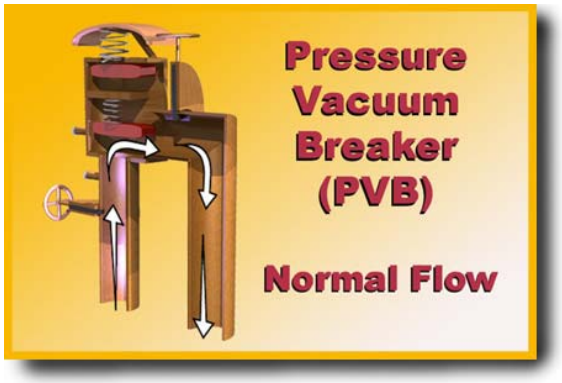
The Cross Connection Control program is continuing to grow and adapt as requirements and new technologies become available. New businesses are being notified, and we are continuing to receive test and maintenance reports from the various targeted businesses. Records are being entered and tracked in our cross connection control database.

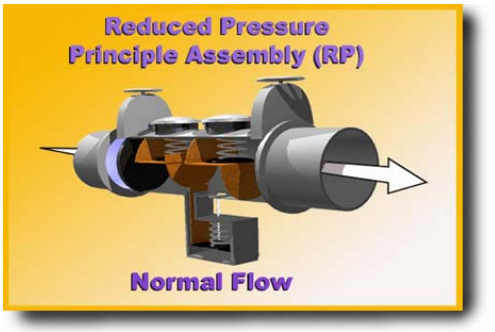
*Report prepared by Maria Rose*

# GENERIC EXAMPLES OF APPROVED DEVICES AND PRACTICES FOR CROSS CONNECTION CONTROL AND BACKFLOW PREVENTION





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Water Quality Laboratory
6100 W. Quincy Avenue
Denver, CO 80235

Phone: 303-628-5996
Fax: 303-795-2495
E-mail: maria.rose@denverwater.org